

WESTERN NATURE STUDIES

By J. H. PAUL.

FURTHER REMARKS ON ARID FARMING.

In estimating the relative value of soils, that part which is insoluble is considered of no use as plant food, since plants can take their food only in the form of weak solutions in the soil moisture. In general, eastern sandy soil is found to contain about 82.3 per cent of matter that is insoluble, and 17.7 per cent of soluble silica. Western arid sandy soil has only 89.7 per cent insoluble matter, and western arid clay soil only 58.7 per cent that is insoluble.

The amount of soluble silica in the soil is also indicative of the degree of fertility. Eastern surface, sandy soil has only 1.5 per cent of soluble silica; eastern clay, 1.5 per cent, and eastern subsoil, 5.3 per cent of soluble silica. Western soils contain, on the average, 2 per cent more of soluble silica than the eastern soils possess.

Humid and Arid Soils Compared.
It will be observed that the insoluble residue is more abundant in humid than in arid soils, in the ratio of 84 to 75. This is because more leaching or washing out of the soil ingredients occurs where much rain falls. The soluble silica is very abundant in the soils of arid regions, making them less sticky than those of wet regions. A large percentage of iron and magnesium is found in arid soils, helping to make them quite uniformly productive under irrigation. These soils show high percentages of soluble matter because sufficient rain and moisture fall to decompose the rocks into soil, but not enough to remove them from the soil by leaching. Arid soils lack humus, which is the abandoned life tissues of plants and animals going back into carbonic acid, water, nitrogen and other gases.

Humus is found in greatest abundance in the humid temperate regions. It is the food of microscopic life in the soil, and is largely produced from leaves eaten by earth worms, which turn them into a black mould. It is like a manure in furnishing food to plants. The humus of arid regions, while smaller in quantity, is richer in quality than that of the humid regions, averaging three times as much; and nitrogen is the most expensive and difficult of plant foods to supply to the soils.

Fertile Western Soils.

Western soils, therefore, are naturally fertile. They contain an abundance of plant food, which may be made available if water can be stored in the soil. Usually there is sufficient rain and snowfall in winter to produce fat crops on the dry soil, even when no rain falls during the growing season. However, the water in the soil is not stored in the soil, but in the water in the soil. For irrigated farms, we store water in reservoirs somewhere above the lands to be irrigated. For dry farms, we store water in soil reservoirs beneath the surface of the land. All that is necessary in order to do this is to have a uniform soil of sufficient depth, say six feet or more before reaching hardpan or impervious clay or porous gravel. A soil alternately clay, sand, gravel, etc., is not good for dry farming. A thinner soil than six feet will hold the water, but it will get too hot if the water is kept, say within twelve inches of the surface by a hardpan at that depth. The water must sink to a considerable depth in order that it may be drawn up by the plants as needed.

Forms of Soil Water.

Soil water exists in three forms. The first form is known as free water, which is water occupying the largest spaces between soil particles. Free water either flows through the soil or stands in it. But when the free water moves, it always goes downward, being controlled by the force of gravity. Even when the free water moves laterally, it is seeking a lower level, and therefore also moving downward. Free water is not used directly by plants, but only as it supplies capillary water above it in the soil. The second

form is called capillary water. This is a thin film of moisture, which surrounds and is held close to each soil grain by adhesion. It is that proportion of the free water upon which the force of adhesion is greater than the force of gravity. It may move through the soil in any direction, and always goes toward the driest places whether they be above or below or upon one side.

Illustration of Capillarity.

Put a small portion of a dry sponge into water. Observe that the water immediately rises to its most distant parts. The water is drawn into the sponge as oil into a lamp wick, by the force called capillary attraction. The smaller the openings, the farther the water will rise, as may be shown by dipping glass tubes having different sized openings into water. If, therefore, the top soil is packed together by rolling or long rest, its capillary tubes are made smaller, and more moisture will arise to the surface, and escape by evaporation than if the surface layer is plowed up or loosened and made open. Capillary water is the chief supply of moisture to crops.

Hygroscopic Moisture.

The third form of soil water is called hygroscopic moisture. It is an exceedingly thin film of soil water, held so firmly to each soil grain that it cannot be drawn away by capillary attraction. It is thought that plants cannot get much of this hygroscopic moisture. Usually the finest grained soils and the colder soils contain more of this moisture than coarse and warm soils contain. Moreover, it is found in soils that appear to be perfectly dry. If the film is thick, the plants may draw it off too quickly, so that the soil merely moist, and not wet, is really the best for dry farming operations.

The Two Problems.

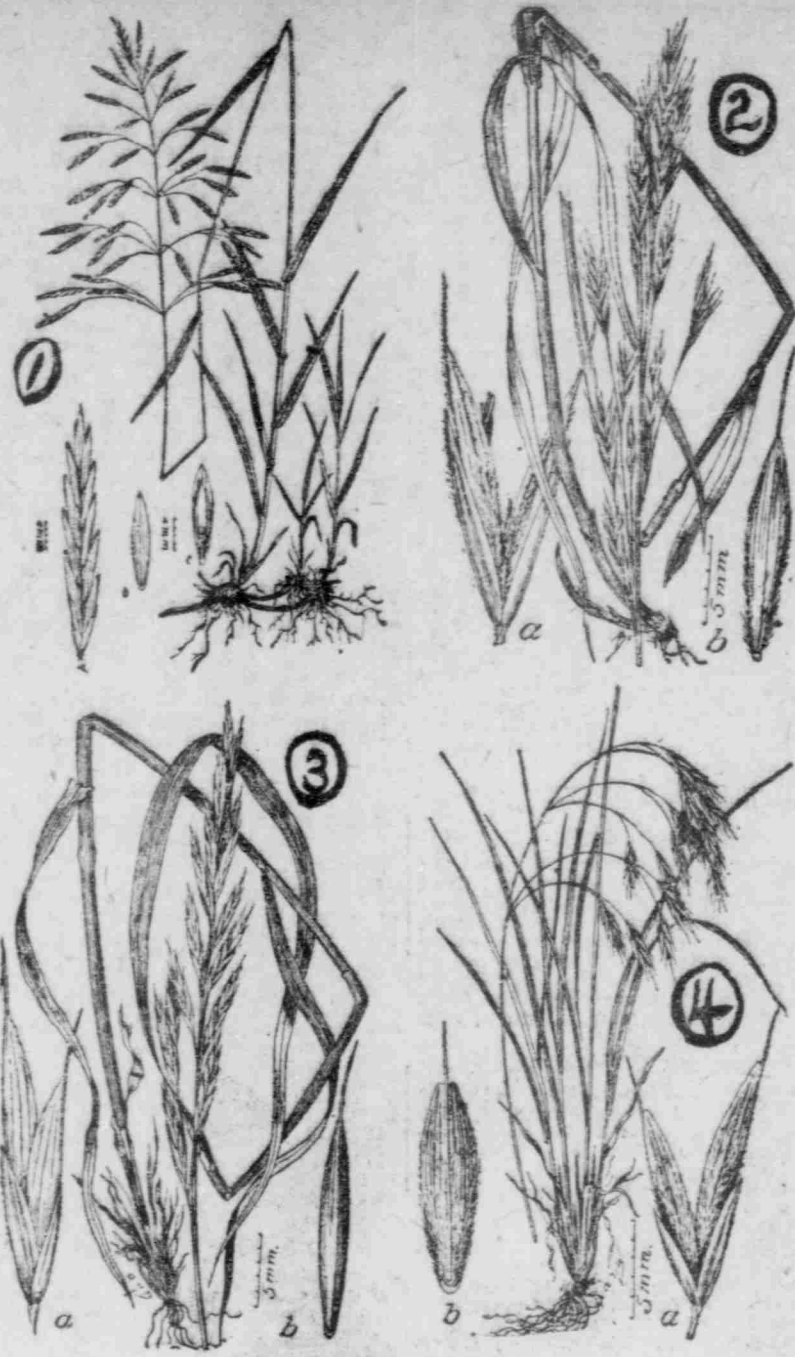
For successful arid farming, two problems are to be solved: First, to catch all the rain of winter; second to keep it from evaporating during the summer. The first object is attained by deep plowing in the fall. In this way about 85 per cent of the winter moisture may be retained till spring. Then the land should be harrowed, so as to form a thick, fine mulch of pulverized soil at the surface. This mulch will prevent evaporation. Therefore the harrowing should be repeated after every rainfall. No weeds should be permitted to grow, since they consume the soil moisture. They should be destroyed as fast as they appear. In this way the water caught in the winter may be kept in the ground during the summer, to be used as needed by the growing plants.

Storing the Water.

In order to store water in the soil, space must be provided in which it can be held until the plant roots drink it in. The soil is composed of rock grains of all sizes variously compacted or thrown together. The soil must be made less like a solid substance and more like a sponge in order to hold the moisture. It must be filled with spaces between the grains, so that it has plenty of the capillary tubes in which the moisture can be held. The more of these tubes, or spaces there are, the more water the soil will retain. The soil must therefore be plowed or loosened in some way. This may be done with a disc plow, or a mold-board plow; but the sub-soil plow should also be used, since deep plowing is generally necessary in order that sufficient moisture shall be stored. When the soil is thus plowed, the "torrential" rains which fall in summer or autumn and the snow or sleet of winter will sink into the soil instead of running off the surface.

How Moisture is Lost.

Soil moisture is lost in two ways: (1) the free water percolates or sinks downward until it is lost to the roots



Brome Grasses of the West.

1. Smooth brome grass—*Bromus inermis*. a. One of the spikelets; by c. front and back view of a flower. This is the grass recommended for planting on the dry farms; it is hardy, smooth, two to three feet high, thrives without irrigation and makes a good hay. It was introduced from Europe.
2. Western brome grass—*B. pumellianus*. A promising native of the Rocky mountains, growing two to four feet high, with long and rather abundant leaves. It deserves a trial in cultivation.
3. *B. polyanthus*. A striking mountain grass, three to four feet high, with large and numerous leaves. It is found on hillsides at great elevations, among fallen timber; horses are fond of it, and it could probably be grown with success in the lower valleys.
4. Porter's brome grass—*B. Porteri*. It is essentially a dry-ground species, one to two feet high, and a good pasture grass. Illustrations from the United States department of agriculture.

of the plants, or (2) the water is lifted by capillary attraction to the surface of the soil. In the arid west, it seems improbable that much, if any, of the soil water is lost by downward percolation through the soil in summer, since the summer heat tends to bring it to the surface. The surface soil becomes drier in the hot weather than that lying immediately below it; and then the moisture rises through the capillary tubes into the upper layers. To keep this water from coming to the surface, we must enlarge the capillary tubes; and this can be done by repeated cultivation and by forming the loose and open "sift" mulch" as the top layer. The rising water is stopped when this layer is dry, but not if it is wet. The effect of our dry, hot summer wind is to sear the top layer, and if it does not bake, to form a layer impervious to the rising water. But if the soil has too much clay and is permitted to dry naturally, it will bake and crack, and through these cracks the moisture will escape.

Effect of Cultivation.

A recent bulletin, No. 61, of the New Mexico station states that experiments often repeated, have proved that the evaporation of moisture from a soil surface is least when that surface is least exposed to the air. It follows,

Dry Farm Crops.

On dry farms the seed should be sown in the fall. The fall grain starts

to sprout before the farmer can get upon the land in spring, and makes use of both fall and spring moisture that would otherwise be wasted by evaporation. Less seed should be sown than on irrigated farms—a little more than half a bushel of wheat per acre in districts where irrigated farms would require perhaps a bushel and a half. Not wheat alone, but oats, barley, rye and especially corn, have all been grown with success and profit. Lucern on lands that receive twelve inches of rainfall, and peas, sugar beets, potatoes, peaches, and even grapes have been successfully cultivated in places without irrigation. It is important to secure seed that has been reproduced on the dry farm for several years. Within certain limits, crops can be adapted to new and different environments. Aquatic plants in time have so adapted themselves as to become dry-land plants. Plants that for centuries have been grown in conditions of abundance of moisture have gradually become adapted to drier climates. This provision of nature supplies the means whereby we are able to transport and adapt crops to new and heretofore untried conditions. Strains of seed which have been successfully grown for years under semi-arid conditions will presently be in great demand. "As a result of this demand, we may reasonably expect pedigreed dry farm crops to appear and they will fill an important want."

Method in General.

A New Mexico bulletin by J. J. Vernon, gives the following concise summary of facts about arid farming: "Dry farming" practices include the following:

- (a) Deep plowing before the rainy season sets in, in order to provide in the soil a capacious water storage reservoir and an ample space for root development.
- (b) Light, deep, frequent sowing or planting in a well prepared moist soil.
- (c) Frequent, thorough, level cultivation before as well as after sowing or planting.
- (d) The use of seed bred and selected for the conditions prevailing.
- (e) The use of machinery of large capacity.
- (f) The adoption of methods for the concentration of crops.

Fall Seeding of Cereals.

Fall seeding of cereals is preferable to spring seeding wherever the condition will permit for the following reasons: (a) The work is distributed over a longer period. (b) The root system of the crop becomes well developed so that spring growth is more rapid. (c) The growth above the surface of the ground, though sometimes small, serves a valuable purpose by modifying the windswept at a time when its effects are most marked, thus preventing, in a measure at least, the blowing of the soil from around the roots of the plants, and, at the same time, holding the snowfall upon the ground until it melts. (d) The crop covers the ground earlier in the spring, thus reducing the loss of moisture through surface evaporation. (e) The crop usually ripens earlier, a feature that is important for two reasons. First, the work of preparing the ground for the next crop can be begun earlier and second, the crop may escape frost more frequently in sections having short seasons.

Retaining the Snow.

It is important to retain the snow upon the land, especially in sections where it forms a large part of the total precipitation. The snowfall may be retained in several ways: First, by leaving the ground rough when the plowing is done late in the fall; second, by throwing up borders across the field at right angles with the prevailing winds; and third, by planting hedge rows or shrubbery across the field at short intervals. The last-named method is preferable wherever possible.

Usually less seed should be planted per acre under dry farming conditions than is used in humid districts. The less the precipitation, the smaller should be the amount of seed planted. The yields in dry farming belts may be and sometimes are very large, but it is not best to expect as large yield in dry farming belts as are secured in humid sections, unless the cultural methods are very much superior.

The bulletin mentions the sagebrush as desirable forms of shrubbery for windbreaks, to reduce the drying effects of the wind. The former article on arid farming stated that few of the brome grasses are of value as hay. The Wyoming experiment station bulletin No. 46, however, names several western forms of undoubted value, and the best of these are shown in the accompanying illustration.

\$25.00 for a Name.

We beg to announce that we are now manufacturing a non-alcoholic beer, and we will pay \$25 for the suggestion of an appropriate name which we may adopt.

Send in your name not later than Monday night, April 19, as on that date we will close the above contest, and award will be announced in Sunday's paper, April 25. If more than one person should send in the name selected, the first one received will be given the prize.

THE SALT LAKE CITY BREWING COMPANY.
Phones No. 17.
Address all communications to "Manager Label Contest, Salt Lake City Brewing Co., Salt Lake City, Utah."

COOPER WAS CANNY.

(Chicago Inter Ocean.)
Cooper, the artist, was so easily copied that many spurious Coopers flooded the market, and the wary old Canterbury painter made a charge for giving his guarantee to his own works. One dealer to whom Cooper owed a grudge, traveled down to Canterbury with a "Cooper" under his arm. He had just sold it for a good price, but required a guarantee. "You have no objection to signing me?" said the caller.
"Not at all," replied Cooper, "but first pay my fee—three guineas—thanks. Now, sir, you go home and burn that, for I never painted it."

Two Thousand Dollars Reward.

Cheyenne, Wyo., April 9, 1909.
TO WHOM IT MAY CONCERN.
The Wyoming Wool Growers' association hereby offers a reward of two thousand (\$2,000.00) dollars for information that will lead to the arrest and conviction of the persons who recently raided the sheep camp of Allemand and Emge, on Spring creek, near Tensleep, in Big Horn county, Wyoming, murdering Joe Allemand, Joe Emge and Joe Lazier, set fire to the sheep wagon and incinerated the bodies, slaughtered sheep and destroyed the camp outfit. Address all communications to GEORGE S. WALKER, Sec'y-Treas., Cheyenne, Wyo.

CALIFORNIA EXCURSIONS

Via O. S. L. and S. P.
May 6th to 10th inclusive. San Francisco and return, \$31.50. To San Francisco and return (one way via Portland), \$48.50. To Los Angeles and return, \$55.75. To Los Angeles and return (one way via Portland), \$55.75. Tickets limited to October 31st. Stopovers. City Ticket office, 201 Main Street.

S.S.S.

PURELY VEGETABLE
GREATEST OF ALL TONICS

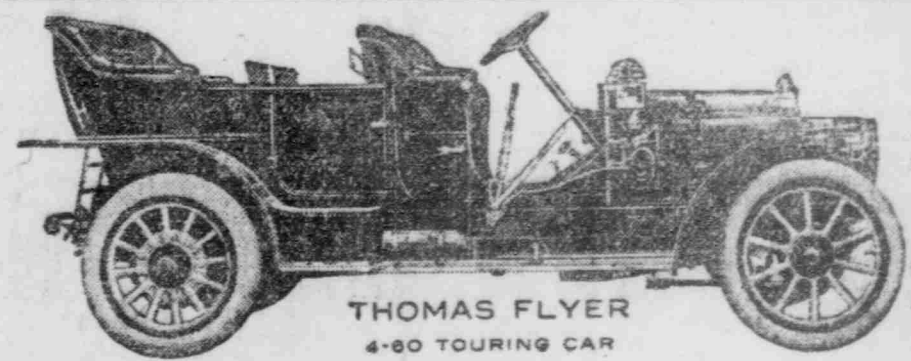
There is scarcely any one, no matter how vigorous and healthy, who does not need a tonic at this particular season. With the first sign of spring-time almost every one begins to feel bad. Some have no particular ailment, but are debilitated, run-down, weak, and their entire system is in a state of disorder. Little physical irregularities upset the perfect working of the blood, the appetite fails, digestion is poor, the energies are depressed, and other unpleasant symptoms give warning that the physical machinery is "out of gear" and needs some healthful, stimulating assistance to build it up to normal, and perhaps ward off some serious sickness or ailment.

This disturbed and disordered condition of health is the result of impure accumulations in the system due to an inactive winter life. The bodily waste and refuse matter is not properly expelled in cold weather, because those members whose duty it is to perform this work of drainage do not receive sufficient stimulation from out-door bodily exercise; they therefore become dull and sluggish in their action; nor is the skin as active in eliminating impurities in cold weather.

These Winter accumulations pollute the blood and destroy its rich, red corpuscles to such an extent that when Spring comes, and everything takes on new life, the circulation is so weakened that it is unable to supply the increased demands of the system, and we suffer in consequence.

The healthful, vegetable ingredients of which S. S. S. is composed, and the method of combining and preparing them so that they build up and strengthen every part of the body, make it the greatest of all tonics. S. S. S. is nature's medicine, made entirely of the healing, invigorating juices and extracts of roots, herbs and barks; a systemic and tonic medicine without an equal. S. S. S. has the additional value of being the best of all blood purifiers. It re-establishes the healthy circulation of the blood, rids the body of that tired, worn-out feeling, builds up the appetite and digestion, and insures a return of strength to those whose systems have become weakened or depleted. S. S. S. acts pleasantly and promptly, and any one in need of a tonic should commence its use at once. S. S. S. is perfectly safe for persons of all ages, being entirely free from minerals of every kind. If you have never used S. S. S. a course of it will make you feel better this Spring than you ever felt before, and it will purify your blood and prepare your system for the long, hot Summer months which are to follow. S. S. S. is for sale at all drug stores.

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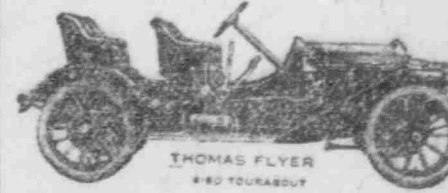
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Hart Schaffner & Marx

clothes; and you can't get anything better. In the ordinary clothing store you get the ordinary clothes; we're different, because the clothes we sell are different; nobody else has anything to equal them, and one comparison will quickly prove it.

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